

## CLAIMS

We claim:

1. A filling system for the delivery of a liquid anesthetic agent from an anesthetic bottle to an internal sump of an anesthetic vaporizer, the system comprising:

a bottle adapter configured for attachment to the anesthetic bottle, the  
5 bottle adapter having an outlet opening through which anesthetic agent from the anesthetic bottle can be discharged;

an adapter valve assembly positioned in the bottle adapter and  
movable between an open position and a closed position, the adapter valve  
assembly including a valve head that prevents the flow of the anesthetic agent  
10 through the outlet opening when the adapter valve assembly is in the closed position;

a filling station positioned on the anesthetic vaporizer for receiving  
the bottle adapter and through which the anesthetic agent can flow into the internal  
sump of the anesthetic vaporizer; and

15 a filler valve assembly positioned in the filling station and movable  
between an open position and a closed position, the filler valve assembly including  
a stationary activation rod configured to contact the valve head of the adapter valve  
assembly and move the adapter valve assembly to the open position as the bottle  
adapter is inserted into the filling station and a valve body movable within the  
20 filling station, the valve body being biased into a closed position to prevent the  
flow of anesthetic agent into the vaporizer, wherein the bottle adapter contacts the  
valve body and moves the valve body to the open position as the bottle adapter is  
inserted into the filling station.

2. The filling system of claim 1 wherein the adapter valve  
assembly and the stationary activation rod are positioned such that the adapter

valve remains in the closed position until the bottle adapter probe is positioned inside the filling station.

3. The filling system of claim 2 wherein the adapter valve assembly and the filler valve assembly are positioned such that the filling valve assembly opens prior to the opening of the adapter valve assembly as the bottle adapter is inserted into the filling station.

4. The filling system of claim 1 wherein the filling station includes a cylindrical open interior defined by an inner wall and the bottle adapter includes a sealing ring formed along its outer surface, wherein the sealing ring contacts the inner wall of the filling station to form a gas-tight seal with the inner wall as the bottle adapter is inserted into the filling station.

5. The filling system of claim 4 wherein the sealing ring contacts the inner wall of the filling station prior to the bottle adapter opening the filler valve assembly to prevent the release of vapor pressure from the anesthetic vaporizer when the filler valve assembly opens.

6. The filling system of claim 1 wherein the filling station includes a cylindrical open interior sized to receive the bottle adapter, the activation rod being centered within the cylindrical open interior.

7. The filling system of claim 6 wherein the activation rod is securely mounted to a mounting block extending across and mounted to the open interior of the filling station, the mounting block having a plurality of flow openings extending therethrough, the flow openings allowing the anesthetic agent to flow through the mounting block.

8. The filling system of claim 7 wherein the valve body of the filler valve assembly includes a plurality of projecting legs that contact a top lip of the bottle adapter as the bottle adapter is inserted into the filling station, the projecting legs extending through the flow openings of the mounting block.

9. The filling system of claim 8 wherein the distance from a top end of the activating rod to a top edge of the projecting legs is less than the distance from the top lip of the bottle adapter to a face surface of the valve head, wherein the top lip of the bottle adapter contacts the projecting legs prior to contact  
5 between the activation rod and the valve head as the bottle adapter is inserted into the filling station.

10. The filling system of claim 1 further comprising:  
a cylindrical keyed section formed on the bottle adapter having at least a pair of protruding indexing ridges positioned at a first angle relative to each other around the outer circumference of the keyed section; and  
5 a filler spout formed on the filling station, the filler spout having a cylindrical outer wall including at least a pair of recessed indexing grooves positioned at a second angle relative to each other, wherein the indexing grooves receive the indexing ridges and allow the bottle adapter to be inserted into the filling station only when the first angle is equal to the second angle.

11. The filling system of claim 10 wherein the first angle between the indexing ridges and the second angle between the indexing grooves are determined by the type of anesthetic agent such that the filler spout can receive only one type of anesthetic agent.

12. The filling system of claim 11 wherein the indexing grooves of the filler spout contact and receive the indexing ridges of the keyed section prior

to the filler valve assembly opening as the bottle adapter is inserted into the filling station.

13. The filling system of claim 10 wherein the filling station includes a cylindrical open interior defined by an inner wall and the bottle adapter includes a sealing ring formed along its outer surface, wherein the sealing ring contacts the inner wall of the filling station to form a gas-tight seal with the inner  
5 wall as the bottle adapter is inserted into the filling station.

14. The filling system of claim 13 wherein the indexing grooves of the filler spout contact and receive the indexing ridges of the keyed section prior to the sealing ring contacting the inner wall of the filling station as the bottle adapter is inserted into the filling station.

15. The filling system of claim 10 wherein each of the indexing grooves is recessed into the outer wall of the filler spout, each indexing groove being defined by a top edge, the top edge of the indexing groove being positioned below the top edge of the outer wall of the filler spout.

16. The filling system of claim 10 wherein the filler spout includes a front universal, prominent indexing groove and an agent-specific indexing groove, the width of the front indexing groove being greater than the width of the agent-specific indexing groove.

17. The filling system of claim 10 wherein the keyed section includes a front universal, prominent indexing ridge and an agent-specific indexing ridge, the width of the front indexing ridge being greater than the width of the agent-specific indexing ridge.

18. A filling system for the delivery of a liquid anesthetic agent from an anesthetic bottle to an internal sump of an anesthetic vaporizer, the system comprising:

5 a bottle adapter configured for attachment to the anesthetic bottle, the bottle adapter having an outlet opening through which anesthetic agent from the anesthetic bottle can be discharged;

an adapter valve assembly positioned in the bottle adapter and movable between an open position and a closed position, the adapter valve assembly including a valve head that prevents the flow of the anesthetic agent  
10 through the outlet opening when the adapter valve assembly is in the closed position;

a filling station positioned on the anesthetic vaporizer for receiving the bottle adapter and through which the anesthetic agent can flow into the internal sump of the anesthetic vaporizer; and

15 a filler valve assembly positioned in the filling station and movable between an open position and a closed position, the filler valve assembly including a stationary activation rod configured to contact the valve head of the adapter valve assembly and move the adapter valve assembly to the open position as the bottle adapter is inserted into the filling station and a valve body movable within the  
20 filling station, the valve body being biased into a closed position to prevent the flow of anesthetic agent into the vaporizer, wherein the bottle adapter contacts the valve body and moves the valve body to the open position as the bottle adapter is inserted into the filling station,

wherein the adapter valve assembly and the filler valve assembly are  
25 positioned such that the filling valve assembly opens prior to opening of the adapter valve assembly as the bottle adapter is inserted into the filling station.

19. The filling system of claim 18 wherein the filling station includes a cylindrical open interior defined by an inner wall and the bottle adapter includes a sealing ring formed along its outer surface, wherein the sealing ring

contacts the inner wall of the filling station to form a gas-tight seal with the inner  
5 wall as the bottle adapter is inserted into the filling station.

20. The filling system of claim 19 wherein the sealing ring  
contacts the inner wall of the filling station prior to the bottle adapter opening the  
filler valve assembly to prevent the release of vapor pressure from the anesthetic  
vaporizer when the filler valve assembly opens.

21. The filling system of claim 18 wherein the filling station  
includes a cylindrical open interior sized to receive the bottle adapter, the  
activation rod being centered within the cylindrical open interior.

22. The filling system of claim 21 wherein the activation rod is  
securely mounted to a mounting block extending across and mounted to the open  
interior of the filling station, the mounting block having a plurality of flow  
openings extending therethrough, the flow openings allowing the anesthetic agent  
5 to flow through the mounting block.

23. The filling system of claim 22 wherein the valve body of the  
filler valve assembly includes a plurality of projecting legs that contact a top lip of  
the bottle adapter as the bottle adapter is inserted into the filling station, the  
projecting legs extending through the flow openings of the mounting block.

24. The filling system of claim 23 wherein the distance from a top  
end of the activating rod to a top edge of the projecting legs is less than the  
distance from the top lip of the bottle adapter to a face surface of the valve head,  
wherein the top lip of the bottle adapter contacts the projecting legs prior to contact  
5 between the activation rod and the valve head as the bottle adapter is inserted into  
the filling station.

25. The filling system of claim 18 further comprising:  
a cylindrical keyed section formed on the bottle adapter having at least a pair of protruding indexing ridges positioned at a first angle relative to each other around the outer circumference of the keyed section; and  
5 a filler spout formed on the filling station, the filler spout having a cylindrical outer wall including at least a pair of recessed indexing grooves positioned at a second angle relative to each other, wherein the indexing grooves receive the indexing ridges and allow the bottle adapter to be inserted into the filling station only when the first angle is equal to the second angle.

26. The filling system of claim 25 wherein the first angle between the indexing ridges and the second angle between the indexing grooves are determined by the type of anesthetic agent such that the filler spout can receive only one type of anesthetic agent.

27. The filling system of claim 26 wherein the indexing grooves of the filler spout contact and receive the indexing ridges of the keyed section prior to the filler valve assembly opening as the bottle adapter is inserted into the filling station.

28. The filling system of claim 25 wherein the filling station includes a cylindrical open interior defined by an inner wall and the bottle adapter includes a sealing ring formed along its outer surface, wherein the sealing ring contacts the inner wall of the filling station to form a gas-tight seal with the inner  
5 wall as the bottle adapter is inserted into the filling station.

29. The filling system of claim 28 wherein the indexing grooves of the filler spout contact and receive the indexing ridges of the keyed section prior to the sealing ring contacting the inner wall of the filling station as the bottle adapter is inserted into the filling station.

30. The filling system of claim 25 wherein each of the indexing grooves is recessed into the outer wall of the filler spout, each indexing groove being defined by a top edge, the top edge of the indexing groove being positioned below the top edge of the outer wall of the filler spout.

31. The filling system of claim 25 wherein the filler spout includes a front universal, prominent indexing groove and an agent-specific indexing groove, the width of the front indexing groove being greater than the width of the agent-specific indexing groove.

32. The filling system of claim 25 wherein the keyed section includes a front universal, prominent indexing ridge and an agent-specific indexing ridge, the width of the front indexing ridge being greater than the width of the agent-specific indexing ridge.

33. The filling system of claim 18 wherein the valve head of the adapter valve assembly is spring biased into the closed position.

34. A filling system for the delivery of a liquid anesthetic agent from an anesthetic bottle to an anesthetic vaporizer, the system comprising:

a bottle adapter configured for attachment to the anesthetic bottle, the bottle adapter having an outlet opening through which anesthetic agent from the

5 anesthetic bottle can be discharged;

an adapter valve assembly positioned in the bottle adapter and movable between an open position and a closed position, wherein anesthetic agent can flow through the outlet opening when the adapter valve assembly is in the open position;

10 a cylindrical keyed section formed on the bottle adapter, the keyed section having at least a pair of protruding indexing ridges positioned at a first angle relative to each other around the outer circumference of the keyed section;



a filling station positioned on the vaporizer for receiving the bottle adapter and through which the anesthetic agent can be dispensed into an internal  
15 sump of the anesthetic vaporizer;

a filler valve assembly positioned in the filling station and movable between an open position and a closed position, the filler valve assembly being movable to the open position upon contact with the bottle adapter as the bottle adapter is inserted into the filling station and wherein the adapter valve assembly is  
20 movable to the open position upon contact with the filler valve assembly as the bottle adapter is inserted into the filling station; and

a filler spout formed on the filling station, the filler spout having a cylindrical outer wall including at least a pair of recessed indexing grooves positioned at a second angle relative to each other, wherein the indexing grooves  
25 receive the indexing ridges as the bottle adapter is inserted into the filling station when the first angle is equal to the second angle.

35. The filling system of claim 34 wherein the first angle between the indexing ridges is based on the type of anesthetic agent in the anesthetic bottle to which the bottle adapter is attached and the second angle between the indexing grooves is determined by the type of anesthetic agent to be received in the  
5 anesthetic vaporizer such that the filler spout can receive only one type of anesthetic agent.

36. The filling system of claim 35 wherein the indexing grooves of the filler spout receive the indexing ridges of the keyed section prior to opening of the filler valve assembly and the adapter valve assembly as the bottle adapter is inserted into the filling station.

37. The filling system of claim 34 wherein each of the indexing grooves is recessed into the outer wall of the filler spout and is defined by a top

edge, the top edge of each indexing groove being positioned beneath a top edge of the outer wall defining the filler spout.

38. The filling system of claim 34 wherein the keyed section includes a front indexing ridge and an agent-specific indexing ridge, wherein the width of the front indexing ridge is greater than the width of the agent-specific indexing ridge.

39. The filling system of claim 34 wherein the filling station includes a cylindrical open interior defined by an inner wall, the bottle adapter including a sealing ring that contacts the inner wall of the filling station to form a gas-tight seal as the bottle adapter is inserted onto the filling station.

40. The filling system of claim 39 wherein the indexing grooves of the filler spout contact and receive the indexing ridges of the keyed section prior to the sealing ring contacting the inner wall of the filling station as the bottle adapter is inserted into the filling station

41. The filling system of claim 39 wherein the sealing ring contacts the inner wall of the filling station prior to the bottle adapter opening the filler valve assembly.

42. The filling system of claim 34 wherein the filler valve assembly includes a stationary activation rod configured to contact a valve head of the adapter valve assembly to open the adapter valve assembly as the bottle adapter is inserted into the filling station and a valve body movable along the activation  
5 rod, the valve body being biased into a closed position to prevent the flow of anesthetic agent into the vaporizer, the valve body being configured to contact the bottle adapter such that the bottle adapter moves the valve body to an open position as the bottle adapter is inserted into the filling station, wherein the adapter valve

assembly and the filler valve assembly are positioned such that the filler valve  
10 assembly opens prior to opening of the adapter valve assembly as the bottle adapter  
is inserted into the filling station.

43. The filling system of claim 42 wherein the filling station  
includes a cylindrical open interior sized to receive the bottle adapter, the  
activation rod being centered within the open interior.

44. The filling system of claim 43 wherein the activation rod is  
securely mounted to a mounting block positioned within the open interior, the  
mounting block having a plurality of flow openings that allow the anesthetic agent  
to flow through the mounting block.

45. The filling system of claim 44 wherein the valve body of the  
filler valve assembly includes a plurality of projecting legs that contact the bottle  
adapter as the bottle adapter is inserted into the filling station, wherein the  
projecting legs through the flow openings of the mounting block.

46. The filling system of claim 45 wherein the distance from a top  
end of the activation rod to a top edge of the projecting legs is less than the  
distance from a top lip of the bottle adapter to an outer face surface of the valve  
head such that the top lip of the bottle adapter contacts the projecting legs prior to  
5 contact between the activation rod and the valve head as the bottle adapter is  
inserted into the filling station.